Instructions: Legibly complete each of the following on lined paper and submit on Gradescope.

1. Let $A = \{1, 3, 5\}$, $B = \{-1, 1, 2, 4\}$, and $C = \{2, 4, 6\}$. Compute each of the following.

   (a) $A \cap B$ (c) $A \cup C$ (e) $B \setminus C$ (g) $A \times B$ (i) $\mathbb{P}(A)$
   (b) $B \cap C$ (d) $B \cup C$ (f) $C \setminus B$ (h) $B \times A$ (j) $\mathbb{P}(B)$

2. Let A, B, and C be sets. Prove the following (via any valid method).

   (a) $A \cup B = B \cup A$ (c) $A \setminus (B \cup C) = (A \setminus B) \cap (A \setminus C)$
   (b) $A \times (B \cup C) = (A \times B) \cup (A \times C)$ (d) $\mathbb{P}(A) \cup \mathbb{P}(B) \subseteq \mathbb{P}(A \cup B)$

3. Let A and B be arbitrary sets. Prove $(x, x) \in A \times B$ if and only if $x \in A \cap B$.

4. Prove each of the following by mathematical induction.

   (a) $\displaystyle\sum_{i=1}^{n} 1 = n$ for all $n \geq 1$
   (b) $\displaystyle\sum_{i=1}^{n} i = \frac{1}{2}n(n+1)$ for all $n \geq 1$
   (c) $\displaystyle\sum_{i=1}^{n} \frac{1}{i(i+1)} = \frac{n}{n+1}$ for all $n \geq 1$
   (d) $\displaystyle\sum_{i=1}^{n} F_i^2 = F_n F_{n+1}$ for all $n \geq 1$
   (e) $n < 2^n$ for all $n \geq 0$
   (f) $F_n \geq (\frac{3}{2})^{n-2}$ for all $n \geq 1$

5. Study for the exam on Friday!